FLOOD WARNINGS:

Responding to California's Flood Crisis

State of California
The Resources Agency
Department of Water Resources
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Cover Illustration: *from "The Climate of California on a Rampage" by Charles Nahl, 1878*

EXECUTIVE SUMMARY

While flooding has always been an unfortunate fact of life in many parts of California, the need for adequate flood management is more critical now than ever before. California's Central Valley flood control system is deteriorating and, in some places, literally washing away. Furthermore, the Central Valley's growing population is pushing new housing developments and job centers into areas that are particularly vulnerable to flooding. Yet, in recent years, funding to maintain and upgrade the flood protection infrastructure has sharply declined. Compounding these challenges is a recent court ruling, *Paterno v. State of California*, that held the state liable for flood-related damages caused by a levee failure. Together, these factors have created a ticking time-bomb for flood management in California.

This Flood Management White Paper presents an overview of the current condition of flood management in the Central Valley and outlines a plan to reduce flood risks through an integrated approach for better planning, new investments, improved management of our infrastructure and closer collaboration between water agencies and users.

SUMMARY OF RECOMMENDATIONS

Flood management in the Central Valley needs an approach that will achieve both short term and long term solutions. This approach should include a set of strategies that involve policy changes, program reforms and funding proposals to better protect California from the devastating consequences and economic impacts caused by floods. These strategies fall under the following set of broad-based recommendations:

1. Ensure the integrity of existing flood project infrastructure through improved maintenance programs that balance public safety and needed environmental protection.
2. Evaluate the integrity and capability of existing flood control project facilities and prepare an economically viable rehabilitation plan.
3. Improve the effectiveness of emergency response programs.
4. Create a sustainable fund to support flood management programs.

5. Update floodplain maps and provide better education on flood risks to the public and to agencies that authorize development in floodplains.
6. Where feasible, implement a multi-objective management approach for floodplains that would include, but not be limited to, increased flood protection, ecosystem restoration, and farmland protection.
7. Evaluate potential policies and procedures that may determine the State's capacity to fund levee maintenance, infrastructure improvements and emergency response in the Delta.

PROPOSED LEGISLATIVE AND CONSTITUTIONAL ACTIONS NECESSARY TO IMPLEMENT RECOMMENDED STRATEGIES

The following suggested legislative and constitutional actions form the basis for an action plan by State Government that is needed to implement the strategies recommended above.

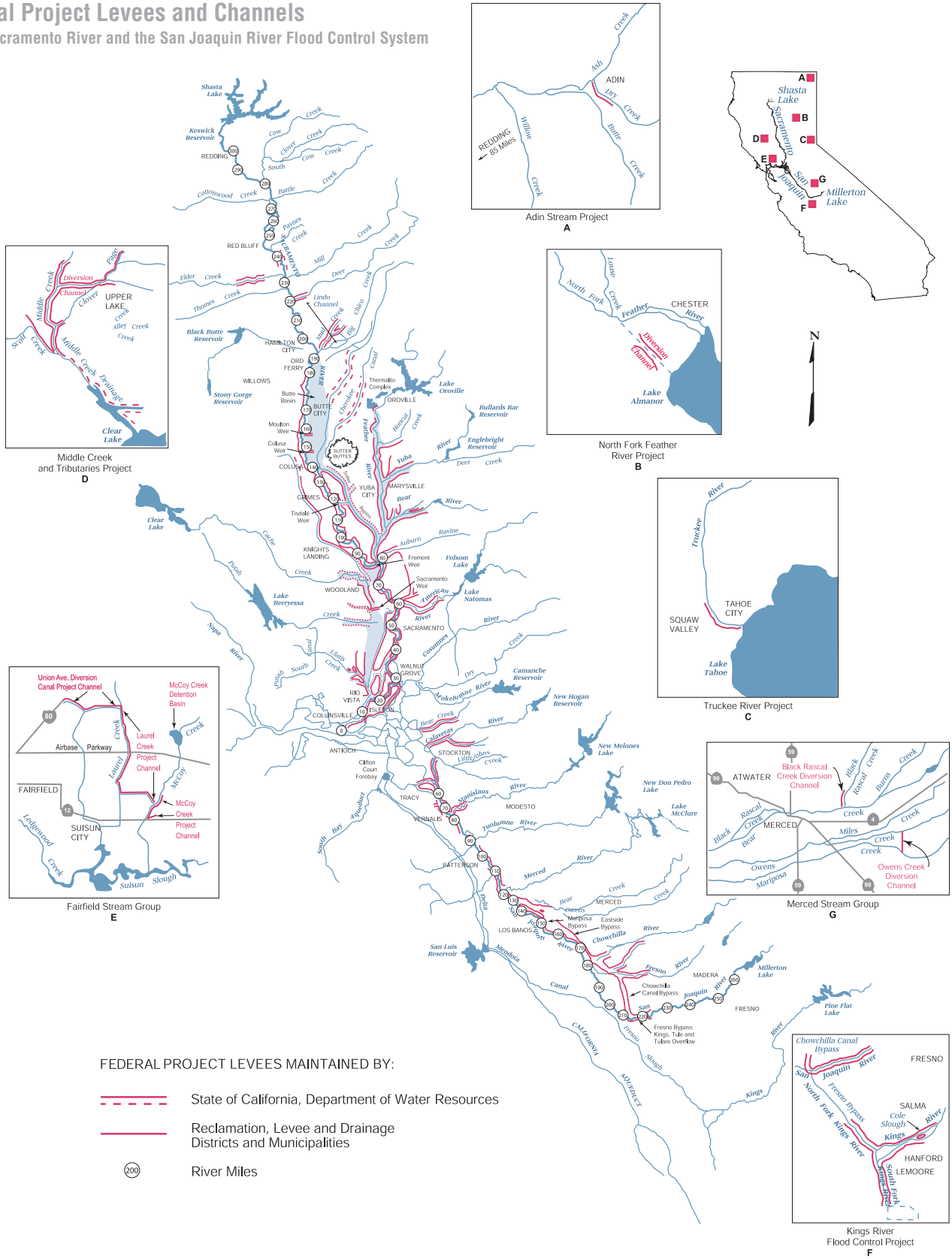
A. Examine existing flood insurance requirements and consider the creation of a "California Flood Insurance Fund," a sustainable State insurance fund to compensate property owners for flood damage.

B. Create a Central Valley Flood Control Assessment District with the authority to assess fees that would provide adequate flood control protection for regional participants.

C. Enact legislative and constitutional changes that would reduce taxpayer exposure for funding flood disaster claims. Revisions would include constitutional amendments to exempt flood control projects from inverse condemnation liability and exempt local flood control districts from the Proposition 218 two-thirds voting requirement.

Federal Project Levees and Channels

of the Sacramento River and the San Joaquin River Flood Control System



THE STATE'S CENTRAL VALLEY FLOOD CONTROL SYSTEM

The State's flood control system in the Central Valley includes reservoirs with flood detention space, approximately 1,600 miles of project levees, and a series of overflow weirs and bypass channels. These facilities were originally constructed by or incorporated into a federally designated flood control project (see figure on opposite page). The State's system discharges through the Sacramento-San Joaquin Delta, which contains over 1,000 miles of non-project (local) levees which are generally maintained by local reclamation districts. The California Department of Water Resources inspects and evaluates the maintenance of all of the State's federally designated project levees and channels. Most project levees are maintained by local agencies, such as reclamation and levee districts. Where the levees provide broad system benefits and local interests are unable to perform satisfactory maintenance, DWR may perform the levee maintenance. Maintenance performed by DWR on behalf of local interests is funded through assessments of benefitting landowners. DWR also is responsible for channel maintenance of the Sacramento River Flood Control Project. Local agencies are responsible for maintenance of the channels of the San Joaquin River system.

THE CHALLENGES

An aggressive investment in the flood management system and a new flood management philosophy is vitally important to public safety and our economic well-being.

Over the years, major storms and flooding have taken many California lives, caused significant property losses and resulted in extensive damage to public infrastructure. However, a combination of recent factors has put public safety and the State's financial stability at risk for even greater calamity in the future:

- Escalating development in floodplains increases the potential for flood damage to homes, businesses and communities.
- California's flood protection system, comprised of aging infrastructure with major design deficiencies, has been further weakened by deferred maintenance.
- State and local funding for effective flood prevention and management programs has been reduced.
- Court decisions have resulted in greater State flood damage liability.

Unless California implements a strategic plan, the next major flood could easily overwhelm the state's deteriorating 50-year-old flood protection system and have catastrophic consequences for our people, property and environment. The State will continue to pay out millions, and potentially billions, of dollars every time a levee break occurs in the flood control system. An aggressive investment in the flood management system and a new flood management philosophy is vitally important to public safety and our economic well-being.

Inundated Structures During the 1997 Floods.

RISING RISK OF LEVEE FAILURES

Deteriorating Flood Control System

California's Central Valley flood control system of levees, channels and weirs is old. Many levee reaches were built more than a century ago on foundations that are subject to seepage and movement. Over time, the levee system has significantly deteriorated, partly due to deficiencies in the original design and partly due to deferred maintenance. Observed deterioration includes levee reaches with internal and external erosion, degradation/removal of natural berms, animal burrows, and settlement. In addition, the uncontrolled growth of vegetation and build up of sediment deposits has greatly reduced the amount of water that flows smoothly through critical channels and rivers.

Hydraulic Mining in the 1800s (photography by Carleton E. Watkins, courtesy Bancroft Library, University of California, Berkeley).

Riverbank and levee erosion has been a particularly devastating part of the overall deterioration. In many levee reaches, the flood control channels were designed to flush out sediments that accumulated in the Sacramento River system from hydraulic mining activities in the late 1800's.

These designs were quite successful in flushing out the mining debris. However, with the debris removed, the powerful flows are now eroding the natural channel banks and the flood protection levees placed on them. This ongoing erosion causes more damage than can be repaired by the State or local reclamation districts using normal maintenance programs. A significant strategic plan element must include a proactive short-term maintenance approach and a long-term project solution.

Many places within the levee system have developed problems caused by underseepage and other internal weaknesses. While studies to uncover these weaknesses have been completed and extensive remedial work has been performed on some parts of the system, much work remains. In addition, it is extremely difficult to detect all hidden deficiencies. As a result, failures occur unpredictably and with little warning.

Due to funding and environmental issues, both the State and local agencies have found it increasingly difficult to carry out adequate maintenance programs.

To address both the known and the developing deficiencies in the system, the U. S. Army Corps of Engineers (Army Corps) evaluated 1,059 miles of levees in the Sacramento River Flood Control Project between 1986 and 2003. This multi-year evaluation found 89 miles of levee that needed significant repairs at an estimated cost of $145 million. While most of those repairs have already been completed, the evaluation was performed using criteria that are now outdated, and did not include all potentially deficient levees. The Army Corps has recently developed new seepage design criteria that will require much more stringent field exploration than earlier guidance. These new criteria are likely to result in identifying many more deficient areas that will in turn ultimately lead to a significantly greater repair cost.

Deferred Maintenance

Due to funding and environmental issues, both the State and local agencies have found it increasingly difficult to carry out adequate maintenance programs. For example, the designers of the flood control system assumed that erodible soil slopes would be covered with rock, an approach that is at odds with protecting environmental habitat. Implementing erosion protection measures that reduce impacts to the environment takes more time, consultation and funding.

Channel and Levee Erosion along San Joaquin River in 1997.

Several performance measures demonstrate that the Department of Water Resources (DWR) does not have the assets necessary to maintain key components of the Sacramento River Flood Control Project at the level it has in the past.

For example, from 1986 to the present, the number of maintenance staff members has dropped from 81 to 53. In the eight years between 1983 and 1991, DWR removed about 10 million cubic yards of sediment obstructing the proper performance of weirs and other flood control structures. However, in the past 11 years, DWR has removed less than three million cubic yards of sediment, a decrease of approximately 80 percent. In partnership with the Army Corps, the State Reclamation Board repaired levee erosion sites on a regular basis through the early 1980s using the Sacramento River Bank Protection

Project, at a cost of about $300 per linear foot with no significant backlog of sites. By contrast, today there is a backlog of nearly 200 erosion sites totaling 120,000 linear feet. With repair costs now as high as $5,000 per linear foot, the bill to repair these sites could eventually approach $600 million. Meanwhile, the erosion continues and new erosion sites are anticipated. Finally, while DWR cleared flood channels of vegetation at the rate of 7,000 acres per year in the early 1970s, that rate has fallen to only about 1,000 acres per year.

Unanticipated Failure of Sutter Bypass Levee in the 1997 Floods.

In 1998, a Levee Review Board comprised of State and Army Corps representatives issued a report detailing the *"overall deterioration of the levee system over several years."* Similarly, the December 2002 Sacramento and San Joaquin River Basins California Comprehensive Study Interim Report states:

> *"Flood risk in this region is rising, as are conflicts between maintenance of the existing flood management system, a rapidly-growing population, and ecosystem needs. Levee maintenance has grown more difficult and expensive due to such factors as poor levee foundations, erosion, and conflicts with environmental concerns. The levees will continue to deteriorate, increasing the flood risk, especially in rural areas."*

Following more than 30 breaks on federal project levees during the 1997 flood, new appreciation was gained for the susceptibility of levees to seepage failures. The Army Corps convened a Levee Seepage Task Force in 2003 comprised of experts from the State, Army Corps, and academia that concluded:

> *"The ongoing deterioration of the levee system needs to be addressed. The [Sacramento] District and its local partners should revitalize their ongoing levee maintenance and monitoring programs to assure that, as portions of the levee system deteriorate, they are identified and corrected before a major flood occurs."*

Delta Concerns

In addition to the challenges of maintaining a viable flood control system in the Central Valley, there are also great challenges in the Sacramento-San Joaquin Delta. The Delta includes nearly 60 islands and tracts lying below sea level that are kept dry by more than 600 miles of marginal levees, many founded on peat soils. Most of these levees have problems associated with long term levee settlement and island subsidence. During the last century there have been more than 140 levee failures and island inundations, most of which occurred during flood seasons.

Levee failures in Sacramento-San Joaquin Delta (Tyler Island) During the 1986 Floods.

More recently, on June 3, 2004, a huge dry weather levee failure occurred without warning on Upper Jones Tract. The cause remains unknown but the effect was the inundation of 12,000 acres of farmland with approximately 160,000 acre-feet of water.

Higher Flood Flows

Traditionally, levee heights and channel capacities have been designed using historical data related to precipitation and runoff. However, due to either limited historical data or climate change, the general trend is for flood flows to be higher than anticipated. Consequently, flood inundations by 100-year flood events now cover much greater areas than those used for design and floodplain mapping just a few years ago. Thus, many existing floodplain maps are woefully out of date.

COSTS AND CONSEQUENCES

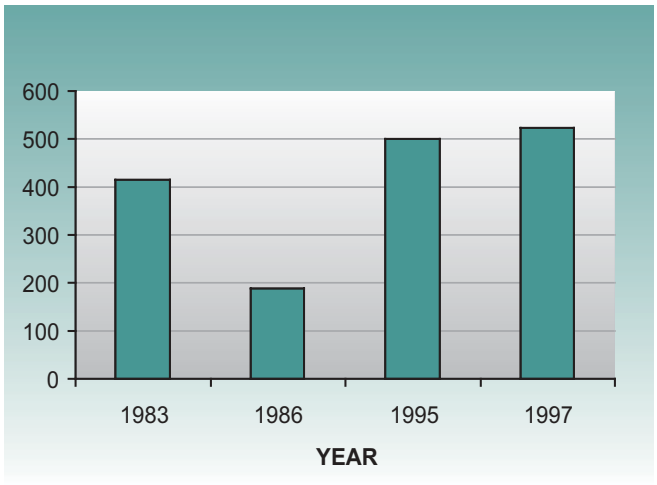
The potential impacts on people and communities of a single failure or multiple failures are catastrophic. These risks tend to be disproportionately higher in rural and economically disadvantaged communities that are often unable to invest in flood control improvements. The 1997 floods forced more

than 120,000 people from their homes. More than 55,000 were housed in 107 shelters, the largest sheltering operation in California's history. An estimated 30,000 residential and 2,000 business properties were damaged or destroyed.

The recent levee break on Upper Jones tract in the South Delta will cost nearly $100 million for emergency response, damage to private property, lost crops, levee repair, and pumping water from the island. There were also significant costs associated with losses in water supply and conveyance. Following the break, Delta pumping was curtailed for several days to prevent seawater intrusion at the State and Federal pumping plants, and water shipments to Southern California were continued only through unscheduled releases from San Luis Reservoir, a large offstream reservoir where water is held after it is pumped from the Delta. Releases were also increased at Shasta and Oroville reservoirs, sending more fresh water to the Delta for salinity control.

In general, the flood control system does not provide the necessary protection for public safety, property and economic values.

Flood Damages (millions)



Flood Damages Caused by Recent Flood Events in the Sacramento and San Joaquin River Basins *(from Sacramento and San Joaquin River Basins, California, Post-Flood Assessment, U. S. Army Corps of Engineers, Sacramento District, March 1999)*

Sudden Dry Weather Failure of Middle River Levee on Upper Jones Tract in 2004.

GROWING RISKS FOR FLOOD DAMAGE AND LOSS OF LIFE

California's population growth presents a major challenge to the State's flood management system. In the Central Valley alone, much of the new development is occurring in areas that are susceptible to flooding. In some cases, land use decisions are based on poor or outdated information regarding the seriousness of the flood threat. For example, many flood maps used by public agencies and the general public are decades old and do not reflect the most accurate information regarding potential flooding. Even worse, many maps were made by simply assuming that federal project levees provided protection from 100-year flood events. Unfortunately, recent experience has shown that this assumption is not necessarily valid.

Better coordination is needed between agencies making land use decisions and the parties, often the State, which must bear the burdens and liabilities of those decisions.

Land use decisions at the local level that allow developments in floodplains protected by the State-federal levee system in the Central Valley greatly increase the risk of State liability for loss of life and property damage. Better coordination is needed between agencies making land use decisions and the parties, often the

Aerial Photograph of Sacramento's Pocket Area Showing Urbanization in a Floodplain Protected by Levees.

State, which must bear the burdens and liabilities of those decisions. The State must develop a process that guides regional development with the goal of protecting people and property at risk in floodplains, while connecting the legal liability of ill-advised land use decisions to those making the decisions to approve development in these areas.

Another challenge is that people who live and work behind levees have a false sense of protection. Many believe that the levees will protect them against any level of flooding. Even if a levee was capable of successfully holding back a 100-year flood, a target flood event used by many insurance and public agencies when providing flood protection, it doesn't mean that a larger flood, such as a 110-year or a 150-year flood event, won't flood their property. During a typical 30-year mortgage period, there is a 26 percent chance that a homeowner living behind a levee will experience a flood larger than the 100-year flood. This risk is many times greater than the risk of a major home fire during the same period.

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GREATER LEGAL LIABILITIES

As the risks of levee failure and corresponding damage increase, California's courts have generally exposed public agencies, and the State specifically, to enormous financial liability for flood damages. The November 2003 *Paterno vs. State of California* decision found that when a public entity operates a flood control system built by someone else, it accepts liability as if it had planned and built the system. The *Paterno* ruling held the State responsible for defects in a Yuba County levee foundation that existed when the levee was constructed by local agricultural interests in the 1930's.

When the levee failed in 1986, hundreds of homes and a shopping center in the city of Linda were flooded. The *Paterno* decision makes it possible the State will ultimately be held responsible for the structural integrity of much of the Central Valley flood control system — 1,600 miles of levees that protect more than half a million people, two million acres of cultivated land and approximately 200,000 structures with an estimated value of $47 billion.

In the *Arreola v. Monterey County* decision of July 2002, local agencies were held liable for 1995 flood damages to property owners that resulted from a failure to properly maintain the Pajaro River project. The maintaining agencies had not

been able to use standard mechanical clearing methods to remove vegetation in the channel because of environmental requirements to protect riparian habitat. Alternative methods to clear the channel had proved inadequate and costly. This decision exposes the State and local agencies to major liability. There is a need to reconcile a time-consuming environmental permitting process with the need for prompt maintenance of critical public safety infrastructure.

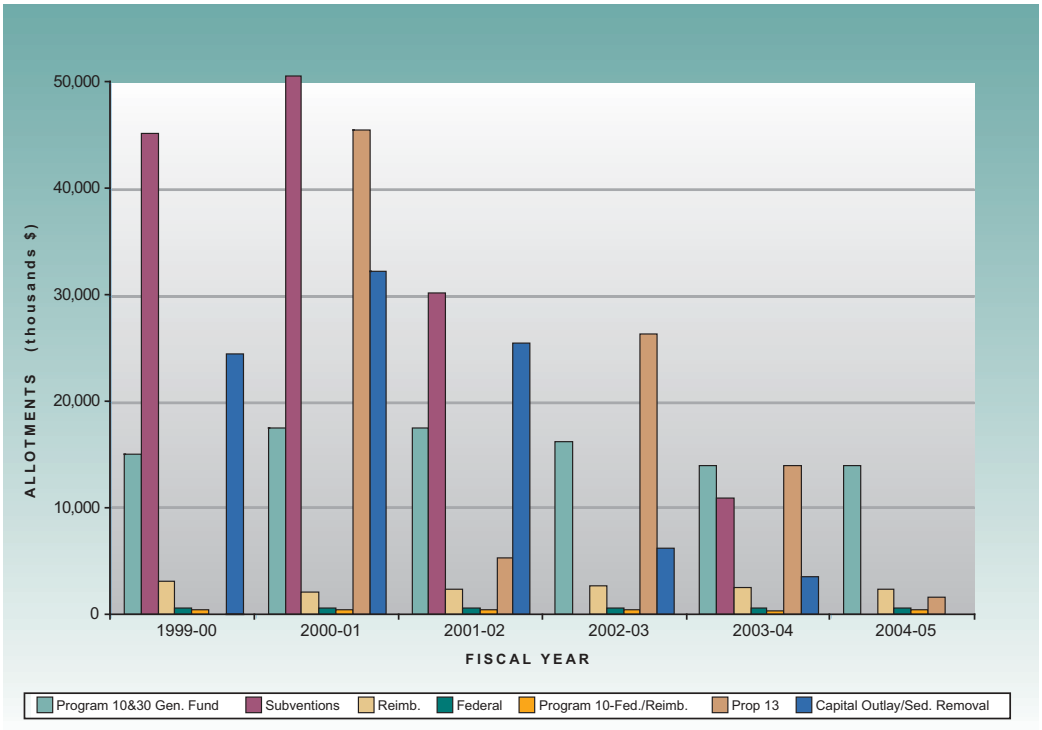
FUNDING

At a time when flood control maintenance and improvement efforts should be increased, the investment in flood management has instead been reduced at all levels of government. Local governments in California have been severely restricted by two constitutional amendments regarding the use of property tax or benefit assessments to generate revenue (Propositions 13 and 218). The federal government in 1996 reduced the maximum that it would pay for the cost of new flood control projects, from 75 percent to 65 percent of the total project cost.

The State's recent fiscal crisis has decreased the general fund's allocations for flood maintenance, improvements, and management activities. Effective emergency response has been hampered by the curtailment or elimination of

Emergency Flood Fight Repairs to a Distressed Levee along the San Joaquin River During the 1997 Floods.

State Flood Management Allotments
(excluding Delta Levee Subventions Program)



critical electronic information systems and mapping capabilities recommended in the 1997 Flood Emergency Action Team report. DWR will have difficulties providing 24-hour coverage at its Flood Operations Center during a flood emergency. In addition, there have been reductions in funding for flood capital outlay and flood subventions programs, the State programs that fund new flood protection projects.

Emergency flood-fighting efforts by State and local teams have been responsible for saving many leaking levees during major flood events. Without these emergency response actions, countless more levee failures, loss of life, and property damage would have resulted. The lack of funding to prevent levee deterioration will mean that there will be more flood fights during flood events, and fewer resources available to save distressed levees and prevent flooding.

Whether it is associated with a major capital improvement or routine maintenance, there are major costs associated with environmental consultation, permitting, ecosystem protection and the mitigation aspects of any flood management effort. In addition, many non-structural flood management

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Emergency Crews Placing Sandbag Rings Around Seepage Boils at the Base of a Levee along the San Joaquin River During the 1997 Floods.

methods are now being pursued, such as the establishment of floodplain corridors and the use of setback levees. These endeavors commonly require more resources than those used in more traditional programs years ago. Consequently, the funding needs for the current flood management system are now much greater because of the requirement to incorporate environmental protection and restoration activities more explicitly in these programs.

The need for increased funding at the local level to deal with a deteriorating flood control infrastructure while pursuing nontraditional and environmentally benign approaches is particularly difficult. The passage of Proposition 218 requires that local assessment increases be approved by two-thirds of the voters. Local flood control agencies have found it extremely difficult to educate voters about the risks of flooding and gain enough support to approve the higher assessments necessary to support an adequate flood control infrastructure. In many cases, the local attitude appears to be a reluctance to pay for increased assessments when the State will pay for any flood damage that might result. The *Paterno* decision reinforces this attitude. This greatly contributes to deferred maintenance at the local level and a substandard flood control infrastructure that is a liability for California taxpayers.

RECOMMENDED STRATEGIES TO RESPOND TO CALIFORNIA'S FLOOD MANAGEMENT CRISIS

Effective flood management lies at the heart of a safer, healthier and economically stronger California. Today, we have the opportunity to take stock of the current situation, improve our programs, invest wisely, work with communities and local agencies, and make a difference for the future. The path to sound flood management will mean accepting positive changes and require a significant commitment of human and financial resources. But business as usual is not an option. California's flood management challenges run deep — but determined action by California's leaders can help reduce the toll — both human and financial — of flood disasters.

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Several excellent studies have been completed recently that provide guidance for flood management solutions, including:

- Final Report -Governor's Flood Emergency Action Team, May 10, 1997.
- Interim Report-Sacramento and San Joaquin River Basins, California, Comprehensive Study, December 20, 2002.
- Final Recommendations Report, California Floodplain Management Task Force, December 2002.

In addition, the Water Education Foundation, DWR, and the State Reclamation Board recently cosponsored a workshop on flood management options and opportunities. This workshop provided a forum where aspects of the current crisis and many potential solutions were discussed by flood control managers and experts. Collectively, these studies and discussions showed that immediate, short-term remedies were urgently needed in many areas of the Central Valley flood control system. However, there was also consensus that a parallel approach was needed to develop and implement a long term vision and set of solutions to this crisis.

The following recommended strategies are intended to provide a framework for both short-term and long-term future actions:

RECOMMENDED STRATEGY 1:

Ensure the integrity of existing flood project infrastructure through improved maintenance programs.

The State should develop a proactive and collaborative process to properly maintain flood control facilities that balances public safety and environmental protection:

- Provide adequate funding and staffing to keep pace with current and projected maintenance requirements.
- Improve levee inspection programs.
- Perform deferred maintenance (e.g. sediment and vegetation removal at critical weirs, pump replacement, maintenance yard repairs).
- Increase staffing and support for State Reclamation Board activities.
- Aggressively form Maintenance Areas to deal with deferred maintenance.

The State should work with environmental groups and agencies to incorporate environmental protection practices in its maintenance programs:

- Develop a framework agreement with resource protection agencies to allow critical maintenance to implement agreed-upon mitigation measures and to provide a process for developing long-term maintenance solutions.
- Develop a "Safe Harbors Program" to effectively manage issues associated with threatened and endangered species.
- Develop a "Mitigation Banking Program" to facilitate the permitting and maintenance of flood control projects.
- Eliminate Fish and Game code criminal liability exposure for individual employees performing within the scope of maintenance work.
- Work with the Army Corps to revise project operations and maintenance manuals to accommodate environmental values that are compatible with the flood control function.

RECOMMENDED STRATEGY 2:

Evaluate the integrity and capability of existing flood control project facilities and rehabilitate those that are economically viable.

The State should partner with the Army Corps and local agencies to:

- Evaluate the system's levees using current Army Corps standards.
- Rehabilitate levees and other project features found to be deficient.
- Modify the system, where required, to provide adequate levels of flood protection and to resolve design deficiencies.
- Authorize the Third Phase of the Sacramento River Bank Protection Project.
- Amend the Water Code to address the problem that occurs when local agencies and/or the Army Corps prevent necessary rehabilitation by refusing to share the cost.
- Develop a State program to continuously evaluate system performance and capacity, and to widen the scope of routine inspection.
- Seek congressional and legislative deauthorization of flood control project facilities that are no longer economically viable (e.g. projects with rehabilitation or O&M costs that exceed the flood damages avoided).
- Develop a strategic long-term flood control plan that would dictate improvements over time to provide high levels of flood protection for urban areas and to restore ecosystem functionality.

RECOMMENDED STRATEGY 3:

Improve the effectiveness of emergency response programs.

The State should implement proposals from the 2002 Sacramento and San Joaquin River Basins Comprehensive Study for Enhanced Flood Response and Emergency Preparedness:

- Enhanced detection of flood potential through improved flood forecasting data and procedures.

- Increased lead-time for notifying emergency response agencies.
- Improved local agency response capability.

The specific steps for implementing these proposals include partnering with the Army Corps and local agencies to:

- Increase staffing for flood operations and flood forecasting programs.
- Restore dual path telemetry to river stage, rainfall, and temperature data.
- Implement statewide emergency preparedness coordination and training programs.
- Improve stream gaging and forecasting capabilities.

RECOMMENDED STRATEGY 4:

Create a sustainable fund to support flood management programs.

California's flood management programs desperately need a sustainable set of funding sources to not only finance flood management activities, but also to provide reimbursement for flood damage caused by inevitable failures in the levee system. A combination of the following sources should be utilized:

- General Fund
- Bond Funds
- Reimburseable funding from the federal government
- Assessment fees from a Central Valley Flood Control Assessment District (see Recommended Strategy 6)
- Mandatory state flood insurance fees (see Recommended Strategy 5)

To provide for a reliable flood control system in the Central Valley, preliminary estimates indicate that capital improvements on the order of approximately $2 billion would need to be spent over 10-15 years, and an annual maintenance budget of about $100 million would be required thereafter.

RECOMMENDED STRATEGY 5:

Examine existing flood insurance requirements and consider the creation of a "California Flood Insurance Fund," a sustainable State insurance fund to compensate property owners for flood damage.

The State should reduce its liability by requiring that all homes and businesses in areas at risk of flooding, regardless of the level of protection, have some form of flood insurance. This will require legislation to enable the State to implement a system of flood insurance similar to the National Flood Insurance Program (NFIP), yet more comprehensive

This approach provides a means of compensation for flood damage that is not dependent on the State's general fund and paid for by those who are at risk of flooding. Within the Central Valley, the area covered by this program would be smaller than the State Reclamation Board's jurisdictional area, but larger than the boundaries of the Sacramento-San Joaquin Drainage District. Other State floodplains would also be included in this program. In general, the higher the level of protection provided by flood control measures, the lower the premiums paid.

The program could be implemented by a statewide insurance fund or by simply requiring those at risk to obtain private insurance. Premiums would be based on parcel size and land use. It would be assumed that a statewide insurance program would be a "no fault" program and would require waiving the right to sue. Any insurance program should be integrated with the federal NFIP and/or local flood assessments to incorporate deductions or credits, along with an alignment of benefits.

This program would be mainly aimed at compensation for flood damage. However, if alternative funding strategies are not implemented (see Recommended Strategy 6), then this insurance fund could be expanded to fund operations and maintenance of flood control facilities and floodplain management activities along with capital outlay projects.

RECOMMENDED STRATEGY 6:

Create a Central Valley Flood Control Assessment District with fee assessment authority to provide adequate flood control protection for the regional benefit of participants.

Amending existing Water Code provisions regarding benefit assessments within the Central Valley for flood control purposes would allow the assessment of parcels that benefit from flood control projects. This financial strategy is intended to distribute the costs of flood control measures among those that benefit from them, thus relieving the general taxpayer in California of the burden. It is also intended to provide a reliable and sustainable funding source for critical flood control efforts.

Funds from these assessments would be used for operating and maintaining flood control facilities, for rehabilitation and replacement of these facilities, maintaining floodplains and upgrading floodplain maps, and for related environmental protection and restoration activities.

In the absence of mandated flood insurance programs (see Recommended Strategy 5), assessments could also be used to compensate people for flood damage. The principal assessment areas would be located in the Central Valley. Alternatives would include:

- One assessment district for the entire valley.
- Two assessment districts, one for the Sacramento Valley and one for the San Joaquin Valley.
- Three assessment districts, one for the Sacramento-San Joaquin Delta, one for the Sacramento Valley upstream of the Delta, and one for the San Joaquin Valley upstream of the Delta.

Assessments could be imposed not only on parcels within floodplains, but also on upland areas in the drainage basins that drain into the floodplain. Manmade activities in the upland areas affect runoff which generally increases the demands on the flood control system in low-lying areas.

RECOMMENDED STRATEGY 7:

Update floodplain maps and provide better flood risk education to the public and agencies that authorize development.

DWR could implement several floodplain management tools to reduce the future public risk due to flooding:

- Active implementation of FEMA map modernization and DWR "Awareness Mapping" programs
- Provide notice to owners of parcels located in floodplains
- Reinvigorate State's designated floodway program
- Acquire flood easements
- Encourage FEMA to establish a mandated flood insurance program for homes behind levees with preferred risk options

RECOMMENDED STRATEGY 8:

Reduce taxpayer exposure for funding flood disaster claims through legislative or constitutional changes.

- The Legislature should revise the State's Tort Claims Act (Government Code Section 810 et seq.) to preclude recovery of damages from the State due to flooding, based on any tort theory or cause of action. Add a specific immunity for flood protection activities, similar to those provided for police and correctional activities, Government Code Section 844, and fire protection activities, Section 850.
- The State Constitution should be amended to exempt flood control projects from inverse condemnation liability. Inverse condemnation was the basis for the *Paterno* decision.
- The State Constitution should be amended to exempt local flood control agencies from the two-thirds voting requirements of Proposition 218.

RECOMMENDED STRATEGY 9:

Implement a multi-objective management approach for floodplains where feasible.

One way to meet environmental requirements in an era of diminishing funding for flood protection projects is to incorporate flood protection practices into multi-objective floodplain management projects. Multi-objective floodplain management projects will enable flood managers to leverage other sources of funding for flood system maintenance. These projects will result in habitat enhancement rather than simply mitigating for environmental impacts, thereby minimizing environmental concerns. Multi-objective management should be the first choice for flood protection where it is feasible and funding partners can be found.

Depending on the circumstances, multi-objective management of floodplains may yield some or all of these benefits:

- Increased flood protection
- Ecosystem restoration
- Farmland protection
- Groundwater recharge
- Recreation
- Open space preservation

RECOMMENDED STRATEGY 10:

Evaluate potential policies and procedures that may determine the State's capacity to fund levee maintenance, infrastructure improvements and emergency response in the Delta.

DWR and the California Bay-Delta Authority (CALFED) have committed to carrying out a Comprehensive Program Evaluation (CPE) for the CALFED Delta Levees Program. As part of the CPE or concurrently with it:

- The State should prioritize which islands and levees should be maintained and protected, and to what levels.
- The State should work with local and federal agencies to establish criteria for funding and participation in any emergency response or flood event.
- The State should establish a fund for immediate emergency response in the case of a levee failure and island inundation. Such a fund would provide for rapid response to contain the emergency and prevent cascading failures to adjacent islands, and allow time for the coordination of a full, long-term response.

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